

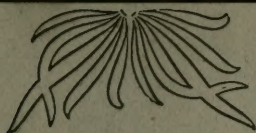
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James Austin Marsh

ALFALFA



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P R E F A C E

AFTER three years service under the Plant Bureau of the U. S. Department of Agriculture, during which time I was employed visiting farmers, on their own farms, for the purpose of interesting them in the best methods adapted to their circumstances, soil and climate, I have concluded to try to satisfy the oft expressed wish for a brief treatise on Alfalfa which may serve as a reference book in which the busy farmer may readily find a guide to each contingency as it develops.

Since men differ, and soils on adjoining farms may differ greatly, and no two seasons are alike, the plans and advice given in the following pages must necessarily be of general application. And while more attention is given to that part of the U. S. lying West of the Mississippi river, sufficient attention to the requirements of the plant will insure success in any part of the known world where plants of a similar nature are found growing wild.

THE AUTHOR

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J. A. MARSH

JAN 12 1914

ALFALFA

Alfalfa is our most important forage plant, and belongs to a group which enables the farmer to draw on the atmosphere for one of the indispensable elements which enter into the life and growth of all vegetation—nitrogen.

Since the practical, every-day farmer knows little of, and cares less for the past history of the various crops he grows, and is more interested in learning how best to prepare for, handle and care for them, a few passing remarks concerning the history and probable past of alfalfa should suffice.

We may assume that as this plant has the power to draw independent of the soil from which it grows, a large portion of its most necessary food, it requires no great stretch of the imagination then, to believe that it was one of the earliest forms of plant life to spring from the face of a scarred and naked planet just emerging from chaos into creation. And while it was known and mentioned by historians of old, on account of the habits of earlier man, was not utilized except in its native habitat. As his knowledge of desirable grazing localities advanced, note was taken of the various plants, and measurable credit given many of those having the greatest economical value as food for man and his herds of domesticated animals. Slowly the grains were recognized and improved. Slower yet the grasses and other forage plants were classified and improved through selection and cultivation. And yet, through the dim vistas of past ages up to less than fifty years ago the world at large knew little of the enormous value of alfalfa as a food for livestock and even less of its adaptability to a wide and ever extending scope of country with varying conditions of climate and soil.

In 1858 the writer first became acquainted with this plant under the name of "Lucerne." Seeds of which were procured through the United States Department of Agriculture, or what has since developed into a Department. Plants of wonderful size, and beauty of form and foliage, were grown from these seeds, but so little was then known of its value and use, it was left to the tender mercy of weeds and grass, and the discriminating taste

of both wild and domestic animals, and the untaught consideration of the pioneer farmer, who must needs grow corn or wheat, or live without bread. However, several plants, protected by stumps or rocks, lived and thrived for many years; objects both of curiosity and beauty for the whole community. We may liken the past of alfalfa to that of the Lost Tribe of Israel, only that alfalfa has been rediscovered—in a new world.

Varieties.

Naturally there are many varieties of alfalfa, all of which are procurable and none of which are better than the best that can now be found within the bounds of all the western states of America. Alfalfa like other crops may become acclimated, or adapt itself to the soil and climate where it has been grown for a term of years. For that reason, beginners or those who wish to purchase seed, are advised to use home-grown seed, produced and sold by reliable farmers who have made a success of the business, thus avoiding adulteration and the introduction of noxious weeds, insects and disease. Just as many of our best forage plants, grains and fruits were introduced from far distant regions of the old world, so also, are some of our most undesirable animal pests, as well as insects, weeds and other plagues.

Alfalfa Soils.

Sowing alfalfa seed on lands adapted to its needs, is like building for all time. So the seed in the one case is of equal importance with the material in the other; therefore the great importance of procuring seed grown as near as may be to your own locality. Much land its natural state is not adapted to the profitable production of this crop; yet it is possible, and often practical, to remedy existing defects in the soil. Liming and under-draining will work wonders with flat, wet or sour soil. Crushed limestone, and not quick lime, should be used. The use of caustic lime on the soil will neutralize the acid condition more promptly than carbonate of lime, but if used in excess of the actual need will also destroy vegetable matter, liberating into the air the identical element, "nitrogen," which is most needed to secure a vigorous growth of plants. On light, sandy soils, in addition to some form of lime, it is always advisable to use all available vegetable matter in the shape of manure, weeds, trash and other refuse of vegetable or

animal origin. However, it must be understood that in order to get immediate benefit of fertilizer in general, it is necessary that it be finely divided and thoroughly mixed with the soil. To apply and plow under manure in chunks or trash in layers in most cases and especially in regions of light rain fall, will result in a partial or total failure of the crop following. Soils with hard pan near enough the surface to be reached, may be rendered fit by the use of the subsoil plow for a time. Hardpan, or shale, may also be broken up by the use of dynamite. Subsoiling, and especially dynamiting is expensive, and in some soils the effect of either is short lived, since the soil returns to its former condition after a lapse of three or four years.

After years of observation and experience, a close observer will arrive at conclusions which may be termed his ideal as to soil and condition which should invariably lead to success in growing alfalfa. As to soil, the writer prefers bottom land, grading from heavy, fertile sandy loam to heavy clay, fairly compact as to surface, and of medium fine particles, growing more open and coarsely porous to a depth of ten feet or more, and better if thirty feet, coarse enough to allow water to drain freely to lower depths, and fine enough to conduct by capillarity, moisture as needed from below; no free soil water, at any time, nearer than ten feet of the surface, and free water at all times, within twenty feet of the surface. While this, my ideal, is rather exacting, and beyond the reach of most of us, we may yet, by careful examination find much land meeting these specifications nearly enough to insure good crops under ordinary conditions, as witnessed by the eminent success of thousands of farmers all over the United States and elsewhere, few of whom have soil described above as "ideal."

Inoculation.

Little need be said about inoculation of the soil with the nitrogen-gathering microbe, which is a probable parasite, feeding on the roots of the plant, causing nodules; because all soils in the western states fit, or, which by drainage or otherwise may be made fit for alfalfa, will, without our aid, become inoculated with this little boarder who pays such a handsome profit for what he eats. That characteristic and very common occurrence in the western states, known as "dust storms," may be his means of

locomotion, and account for his wide distribution over the great region of plains country, where real estate, regardless of value, sometimes gets high.

Where inoculation seems necessary, soil procured from a field where alfalfa is a success may be used and sown with the seed or drilled separately. One bushel per acre more or less should serve.

Preparation of Seed Bed.

In the preparation of the seed bed for alfalfa, it should be more generally understood, that, not only alfalfa, but all other plants germinate and grow afterwards with greater rapidity if planted in a firm seed bed, and that any plowing, in the preparation for any crop, to be of value to that crop, under any ordinary circumstances, is done for the purpose of mixing and stirring the soil, and in no case to loosen it. So then if you cannot repack it firmly back to the subsoil from which it has been separated by the plow, you are advised not to plow it at all. This is not intended to convey the idea that plowing may not be beneficial, but rather that plowing when left loose below, is most sure to prove a detriment. The writer is decidedly in favor of plowing, and has no fear that the reader may plow too deep, but insists that the land should be plowed only when in such condition, as to moisture, that a good job may be done; and further insists that at least each half-day, in windy weather, all the fresh plowed land should be repacked back to the subsoil practically as closely as it was before plowing, leaving from one to one inch and a half of the surface loose, so that the least possible portion of the soil moisture may escape, and to form a loose earth mulch below which the seeds may be placed, to protect them from the drying action of sun and wind, until they have germinated.

As to plows, I prefer the mould board, or turning plow, because it buries weed seed below the germinating zone. For repacking the freshly plowed soil, no tool can excel the common disc, set straight, with from five to eight hundred pounds of weight on it. In any case this discing should be repeated until the soil is firm with no bridged-over air spaces below. A good plan by which we may be sure that our subpacking is thorough, is to take a very sharp spade, use a striking motion to get down through the surface soil without disturbing the surrounding soil; shave away

until the subsoil is reached, observing as we progress, that no air spaces show, and that the feel on pressing the fingers into the earth, shows that it is firm. It is advisable to use a spike-toothed harrow with the teeth set at an angle of forty-five degrees, first after the plow for the purpose of smoothing the surface, but in no case should the harrow be used as a drag with the teeth flat. In fact it is very wrong to use a drag of any kind, and a roller is equally objectionable. The surface soil should be loose and grainy. The drag would reduce it to too fine particles or even to dust, and the roller would pack it at the surface, both of which conditions will often prove fatal to the stand in case of either beating rains or high wind, if they occur before the seeds have germinated or while the plants are very small and tender.

It is generally recognized that all plowing for whatever crop, should have been done for a sufficient length of time before the season for planting arrives, to allow the soil to become firm through the action of soaking rains, and, generally speaking, that is the cheaper and, for that reason, the better plan. Yet for all practical purposes, when it is deemed necessary to plow just before planting, we may secure equally as good results if the preparation is thoroughly finished, as before advised. There are frequent cases, however, in which plowing is not at all necessary, and still others where plowing is not advisable. For instance, where alfalfa is to follow corn or other crops, which have had clean cultivation, and the surface is level, the stalks may be removed and the surface scratched with a spike-toothed harrow set at near perpendicular to form a loose earth mulch to a depth of from one to one inch and a half, for the purpose as above stated. Also on sandy soils, where the problem is to prevent drifting, alfalfa may best be sown without plowing, following cowpeas, which have not been removed, except in part, by pasturing, so that sufficient stubble and vine yet remain to prevent blowing. The writer has observed successful stands where the seed were sown on land without any previous preparation, where a crop of crabgrass hay had been removed, and even on cane stubble. However, success in such cases is rather rare. Not because of lack of preparation, but because first, light sandy land is not adapted to alfalfa; second because neither crabgrass nor sorghum are proper crops to precede alfalfa, from the fact that both leave the soil in poor physical condition and

often in a wrong chemical state, or acid, rendering bacterial life, of the nitrogen gathering variety, impossible. True, this souring may be remedied by the application of some form of lime, and that part of the objection to these crops overcome, and a fair growth of alfalfa secured. Generally, lime, and often phosphorus, are lacking in light, sandy soils. So when the plants are observed to be making poor growth, we should either abandon the attempt to grow alfalfa on such soils, or else apply the elements which are found wanting. My reason for devoting so much space to this type of soil is that there are so many farmers living on, and farming such land, who appreciate the value of this greatest of forage, and earnestly desire to grow it for their own use. And further, a few tons of limestone with the addition of phosphorus and potash and manure will not only render sandy land fit for alfalfa, but equally advance its value for any other crop and discourage the growth of crabgrass and other creeping weeds.

Seeding.

Unfortunately this operation has been surrounded by would-be writers with mystery, out of all proportion, since it is, in truth, just as simple as the very ordinary act of sowing radish seeds. We should divest our minds of all this accumulated rubbish, mystery and other things which we have learned that are not true, and approach this subject free from all pre-conceived ideas and prejudices. If we will do so, we may at once discover in the light of reason, how like the seeding of alfalfa is to the seeding of any other crop, and how modest and simple its wants really are. We may broadcast by hand, we may use a cyclone seeder, or a wheelbarrow seeder, or a wheat drill of most any make, or one with an attachment for the purpose. Indeed one successful grower said, after preparing his land as I have herein described, he needed only to haul a hayrack load of unthreshed seed back and forth across his field. Whereupon another scoffer at all this mystery, declared that he needed neither team nor wagon, all he needed to do, was to walk across back and forth at the same time shaking some of the "hay seed" out of his hair, and I suspect there were good brains under that crop of seedy hair.

Amount of Seed Per Acre.

My ideal method calls for a seeder attachment on an old-fashioned shoe drill with one or two links of chain dragging behind each shoe. My reasons for this are that we may know just how much to the acre we are sowing. We are depositing the seed beneath the loose earth mulch, onto, and in direct contact with firm soil, and therefore we waste no seed, as all should grow if we have the necessary moisture. And now we come to deal with more "legendary lore" that is too ridiculous to command the respect of an amateur prevaricator. If we stop to consider the number of alfalfa seeds it takes to weigh one pound, we may see that if all are well distributed and all grow, they will cover one acre with all the plants needed to use to the best advantage all the moisture and available food and space at their disposal, making a complete stand. But on account of their diminutive size, more in proportion to larger seeds like corn, are likely to be too deep, too shallow, or to be destroyed by the elements, insects or birds. So then, I advise generosity in their use, and give all the agents of destruction two, four, seven, or even as much as nine pounds per acre, according to the manner of sowing. For instance, if sown by hand, ten pounds, cyclone seeder, eight pounds, wheel barrow, about the same, ordinary wheat drill with trash or bran to make the machine feed less, five to eight pounds, and with the attachment on drill, three and one-half to five pounds, per acre.

And here let us reason once more together, in this wise. Each of these little tender nurslings is calling for the same food at the same time; if the Mother Earth cannot supply the urgent demand when they need it, and in the proper quantity, there is sure to be infant mortality. Now since we have sown probably, fifteen or twenty pounds per acre, enough for from fifteen to twenty stands if they all grow, we reason that we can afford to have a large per cent of these little plants crowded out, and still have plenty left and to spare. But here is where we are short sighted. We are depending on that cruelly beneficent law of nature, through which the fittest are allowed to survive, and forget that the whole operation has not been left to wise old Mother Nature. We forget that nature has been aided by the bungling hand of man. We forget that a seed bed adapted to induce rapid and complete germination has

been artificially prepared, thus forcing an undue call on nature for which there is no law. The result is, all, or practically all the plants, are alike, and at the same stage of dependence, and if one dies, the same cause cuts short the career of all, in spots at least. Consequently we have a spotted stand, which means, simply, no stand, so far as practical results go. The writer can cite you numerous cases to prove there is lavish waste of seed and criminal ignorance on every hand, in this matter; which reminds one of the city bred man and his wife who moved back to the land; he to raise porkers; she chickens. Mrs. City-bred bought a hen and forty little chicks which the hen mothered and fairly spread herself to hover, and they being properly fed, all thrived. Seeing which, Mr. City-bred bought a sow and added to her litter of eight pigs, thirty-two more little pigs. The chickens all thrived and the pigs all died. So these City-bred folks decided that chickens and pigs are different.

Depth of Covering the Seed.

The depth to which seed may be covered is as varying as the climate, time of seeding and the soil.

Early sowings should invariably be covered very shallow in a dry climate or not at all in a moist climate. Later seedings in a dry and windy climate may be covered full two inches deep. The dryer climates and the lighter soils require deeper covering at any given date of sowing, and if it be found necessary to cover deeply, no chain, drags or press wheels should be used behind the drill. A fairly good rule which applies in a moist climate is to cover any seed planted with a layer of soil equal in thickness to two of the seeds to be covered. In all cases well matured seeds will be able to penetrate the soil from greater depth than poor or immature seeds. When using a drill for sowing small seeds it is always advisable if the surface soil is loose, to remove the springs and let the discs run only as deep as their own weight will force them.

In this connection I wish to call the attention of the reader to the fact that alfalfa has already proved itself adapted to as widely varying conditions of climate and soil as any other crop or plant known. It will survive the fierce heat of southern California and the the extreme cold of North Dakota. It will grow at the level of the ocean or ten thousand feet above. It will produce a crop of

hay or seed where the rainfall is less than twenty inches per annum or several crops where more than six feet of water falls from the heavens. It will grow anywhere or nowhere according to the man. It will grow for one farmer and refuse to grow for his neighbor. This suggests that there may be more in the man than in any known combination of soil, climate or crop.

Nurse Crops.

The idea of sowing some other plants with alfalfa for the purpose of nursing or protecting the young plants from the rigors and other dangers incident to all infant life is a beautiful theory prompted by a generous and kindly heart. But it savors very much of the old idea of hardening children by exposing them to inclement weather and the dangers of undesirable associates in the belief that if they survive the one and prove superior to the degrading influence of the other, they eventually prove worthy citizens. The writer is of the opinion that nature has provided weeds and grass sufficient to nurse the tender alfalfa plants if they need a nurse crop and that children may be relied on to find, without the aid of elders, all the rough corners of this life in nature, and all the perverted morals in man that could be of possible use in a well spent life. And also if the alfalfa survives, it does it in spite of the disadvantages of weeds, grass, and alleged nurse crops. Late fall sown alfalfa may be benefited by protection from extreme cold and high winds which often drift the soil by a dead nurse crop such as millet which may be sown for that purpose and which will be killed by the first freeze, otherwise the writer cannot endorse the "nurse crop" idea.

Failure--Reasons For.

There are many causes to which failure to secure an even and a perfect stand of alfalfa may be attributed. I should say that the cause of most failures is due to a lack of knowledge of the adaptability of the soil for that crop, or if adapted, how to prepare the seed bed. Among others, I may mention too much seed, lack of moisture while plants are young, grass and weeds; too late fall seeding and consequent loss by freezing; over pasturing; drowning through lack of drainage; seed grown under irrigation sown on nonirrigated land, or from too far north where no long hot dry spells occur, or, from too far east, where the rain fall is greater

and better distributed over the season, or too far south where winters are mild. These last, come under the head of acclimated seed, and last but not least, poor or adulterated seed, which is expensive even if given to you, with a chromo thrown in for good measure.

Clipping.

Many failures are also due to a lack of knowledge or judgment in clipping the young alfalfa the first time. In this case unfortunately, I feel unable to guide the novice, or the erring, to assured safety, on account of such varied contingencies as may present themselves. Yet I may, without presumption, offer some advice, which may help to guide a close observer. Most frequent and grievous is the mistake of the man who has a new mower and wants to try it on something. Or the neat and tidy, nervous, farmer who cannot bear the sight of grass, and weeds, thriving where he wants alfalfa, apparently blotting out his hopes of securing a stand on that laborously prepared and once clean field. Instead of waiting until the grass is headed out, and the weeds have become sufficiently woody at the crown to prevent further sprouting from the stubs, both of these men, unless powerfully restrained, will sail in and clip the alfalfa, grass and weeds from ten days to two weeks too early. This will prove fatal to the most perfect and promising stand, if followed by an extended period of dry weather during the first season. The reason for this failure is in the fact that the weeds cut when tender, sprout from the stubble about as readily as alfalfa, but unlike the sprouts from alfalfa, they do not usually grow upright; so that when an effort is made to clip them thereafter, they escape the knife, and continue to grow all summer, robbing the alfalfa, which has to fight an unequal battle with both mower and weeds. In the case of grass, and especially crabgrass, the clipping away the taller weeds and alfalfa, gives it sun and air, and while a few of the upright blades and stems may be clipped off, that only encourages it to grow in the way nature intended it should; viz., clothe the earth with green tights, and it needs no better care to help it fill its mission. Weeds of upright habits of growth are no particular menace to a stand of alfalfa, if caution and watchful care is used so that they may be clipped at the proper stage of development, or immediately after the lower stems have become too woody to allow of a sec-

ond growth of sprouts. Often it is necessary to allow sunflowers and other varieties to stand until there is doubt about being able to cut them with a mower, and even until the alfalfa seems to be about smothered out. Usually it is best to let the weeds lie as they fall. Yet I have seen cases where the growth clipped made too heavy covering and smothered the alfalfa out. With low-growing or creeping weeds and grass, the proposition is quite serious; and I hesitate to offer hope of securing a stand of alfalfa on land matted with either. If the subsoil is full of moisture, and the alfalfa plants have a good color, and are growing freely, I should let it fight it out; otherwise, it should be turned under before the weeds and grass mature seed. In this connection it might be well to state that soils well adapted to the growth of crabgrass, are not well adapted to alfalfa, not because of the presence of the grass, but rather because the elements needed for the best development of one are not adapted to the best or greatest development of the other. So there are two reasons why these plants should not be found together in the same field.

Time For Seeding.

The time when nature does her seeding, unaided by the hand of man, should in a measure, guide us. If left in a state of nature, alfalfa matures seed from July to November, and most seeds which come in contact with the soil under proper conditions as to moisture, usually germinate promptly, and as promptly fall a prey to insects, or the crowding and shading of other plants. Seeds continue to drop from the pods and if moisture sufficient be present, germinate, until winter. Most of these plants, however, fail to survive the winter because of unfavorable conditions, which render it difficult for these young plants to become thoroughly established. But a large per cent of seed failing to come in contact with the moist earth, or at least not for sufficient time to cause germination, arrive safely, with unimpaired vitality, to the dormant season, or winter, during which winds, rains and snows, and the freezing and thawing of the earth, insects, and the trampling of animals, all conspire to bring them into intimate contact with Mother Earth, to awaken at the first breath of spring. I say at the first breath of spring advisedly. As may be seen by a most casual observation, alfalfa seed germinates as early as the most

hardy weeds to be found in any climate. They not only germinate, they live, in spite of oft recurring freezes. Wherever you find the hardiest weeds surviving you may also find alfalfa. Having observed this, and having experimented with many of the cold resistant weeds, grains, clover and alfalfa, I have arrived at the conclusion that alfalfa is one of the most hardy plants with which we deal. The one limiting factor is moisture, as is also the case with all other plants, none of which, not excepting wheat, can stand an unusual degree of cold when the earth is dry. So then, trial was made to prove the reliability of this conclusion, and seeds of various hardy plants, including wheat, oats, lambsquarter, sunflower, red and white clover, and alfalfa were observed during November, Dccember, January, February and March, most of which when sown in early December germinated, the sunflower and lambsquarter, remaining dormant. Almost all the seeds that germinated perished during a dry windy February. Now and then a plant of every variety survived when protected by rubbish. While that sown later practically all survived where germination occurred about February 20th, and all passed successfully through several freezes. I find that all hardy plants germinating during February usually survive any freeze which is likely to occur at that season in Oklahoma if the roots are surrounded with properly moist soil. Summing up my experience and observation along this line I find it usually safe to sow alfalfa at any time after December 15th in Oklahoma if I have all possible necessary moisture. Otherwise, I should wait until the last of February or the first of March, or later further north. But for all practical purposes, and for the very best prospects of success in this part of Oklahoma, (Kingfisher County), I advise sowing on the later dates, namely, last of February or first of March. A few days, eight or ten, either way should not make any material difference.

Perhaps it may interest the reader to have here a recapitulation of my reasons for preferring to sow alfalfa as above advised. Early fall seeding is exposed to numerous insect depredations, notable among which are webworms and grasshoppers. Late fall seeding is very liable to perish during a cold dry winter, while the early spring seeding has the advantage of all the annual grass family and even fight with annual weeds, besides having time to become well rooted before the violent rain storms which usually

occur in May and June and which prove so destructive to the later sown alfalfa. And then besides the greater probability of securing a stand from early sowing, we have with it, practically an equal show of securing a crop or two the first season, as with fall sowing. As a guide to those of my readers who wish to follow my suggestions and sow early, and yet do not live at the same altitude and latitude, all that is necessary, is to watch the germination of hardy weeds in garden and field. Having our land prepared and our seed ready we may safely proceed to sow alfalfa as soon as weeds begin to show above ground on soil which has not been disturbed and where the weed seeds have been sown by the hand of nature.

Pasturing.

And now having a stand of alfalfa, well established, the time has arrived to dispose of the crop to the best advantage. For many reasons, some of which I hope to treat at greater length under the proper subdivision, there is no doubt that the greatest value of this crop may be secured by using it to feed and grow livestock on the farm. Then we may consider various ways of utilizing the crop as a feed. And as all animals prefer to choose when, where and what they shall eat, and as the immediate effort on the part of the owner, as well as the expense, is materially lessened, it is very desirable to utilize at least a portion of our alfalfa fields as pasture. And here we meet with a popular misconception of the ability of alfalfa to stand pasturing, many writers claiming that alfalfa is not a pasture crop. Now while we are well aware that alfalfa on unsuitable soil where it may be able to eke out a bare existence only, is worthless, as a pasture, if we stop to consider, we also know that any grass or other forage plant growing or attempting to grow on land not suited to its needs, is also not capable of furnishing pasture of value. But given a field of alfalfa, on soil adapted to its needs, and moisture to fill its demands, no other forage plant or grass common in this region can compare with it in the amount and value per acre as a pasture. Horses, hogs, chickens, turkeys, geese and ducks may have the run of the fields during three-fourths of the year. The only times when alfalfa should not be pastured are: first, when starting its spring growth and second, when it is frozen. Early spring pasturing is

just as hard on alfalfa as it has proved to be on any other pasture, forage or grass. Any plant nipped off in the early stages of its first spring growth, alfalfa, or any other perennial is stunted for the season, and all annuals are damaged for life.

As a guide to follow and insure the greatest profitable return, and at the same time not injure the crop or grass to be pastured, regardless of what or where it is, in no case should it be pastured so closely that sufficient may not be left for harvesting at the regular time and in the same manner as would happen if it were not pastured at all. However, alfalfa like some other forage plants and weeds may not safely be pastured by cows, sheep, and probably goats at all stages of development and conditions of weather, on account of its tendency to cause the formation of gas in the stomach, which often results fatally to the animal. Just why a cow feeding on green alfalfa or other forage, may bloat and die within an hour, or may live to eat same food possibly, for two or three years, and then suddenly die, has not yet been satisfactorily explained to the writer. As a rule worthy of note, pasturing any ruminating animal on thriftily growing alfalfa, is hazardous, and in average cases under the writer's observation has proved unprofitable.

However, this is not intended to convey the idea that alfalfa may not be pastured by ruminants, or animals which chew the "cud", under all conditions. When the plants are mature, well past full bloom, and are not sappy, there seems to be no further danger of bloat, even though the animal may eat its fill, and at any time of day or conditions of weather. Then again, there seems little danger, regardless of stage or development of the plant, rate of growth, or condition of weather, if the animals being pastured have free access, at the same time, and all the time, to a variety of forage plants, together with starchy grains.

The writer has observed cases where cows having access to a variety of other grass and weeds known to be greatly relished by this discriminating animal, and well supplied with grain, both morning and night, were apparently free from bloat, this should lead us to suspect that some law of nature has been outraged; some condition imposed by the hand of man, in his blind attempt to "have dominion over every living creature", that does not accord strictly with the scheme of creation. An animal, untram-

meled by arbitrary bounds set up by man, in the shape of fences, roams at will, choosing food, shelter and drink, and is guided by an unerring instinct, which is more dependable than all the vaunted wisdom and reason of mere man. If the reader has been denied the opportunity of observing wild animals in a state of nature unharried by the fear of man, he may at least have observed cases of outlaw samples of them, among our domestic animals, trained to become rogues, through lack of proper fences, until they come to recognize no bounds and no rights of our neighbor's property. He knows that such an animal seems to possess a devilish immunity from all bodily harm from over-eating of any forbidden fruit, sufficient to speedily kill any ordinarily well behaved and respectable member of its herd. Now it is not at all probable that this animal is possessed of a "devil", but rather, it has followed its natural instinct, which led it to rustle all the food, and of all the varieties needed to make a good, healthy and strong animal. In the beginning, we were granted dominion over these animals. But we go too far, when we arrogate to ourselves authority to say to them, as God said to Adam and Eve, concerning the fruit of a certain tree, "Ye shall not eat of it, neither shall ye touch it, lest ye die". Indeed, we are constantly seeking by laborious and painstaking research, to find through artificial means, the best feeds and the proper proportion, and the amount, and the time, to give them to old Dobbin, old Bossy, Bidby, and the rest of these poor pensioners at our will. If we approach the question of feeds more directly, and simply offer our animals a variety, and a plenty of it, we may soon learn by that which is eaten, or is discarded, what the best feeds are, and also, their proper proportion for the best results, whether the product sought in eggs, milk, flesh, horsepower or offspring. A little knowledge of science, is a great aid. Science is based on the laws of nature, and is simply a smattering knowledge of them classified. No doubt we may yet learn from the cow, how she may be free from bloat, though pasturing growing alfalfa. We may even learn how best to feed green alfalfa properly, before we learn how best to feed cured hay, simply because the hay may be fed in any quantity, without apparant bad results. Yet alfalfa hay, cut at the right stage, and properly cured, is really, a very concentrated feed. Its bulk fools the thoughtless man into the notion that it may be used as a "filler", like wheat or oat straw, or timothy or prairie hay. On the contrary, it should be used as a "concentrate", like corn or kaffir, or cotton, and linseed meals. No dairyman or beef feeder can hope to get full value for the grains he feeds, unless he uses in combination with them, alfalfa, or some other feed like it, rich in milk or flesh forming elements. And if we can grow this feed, we are indeed fortunate. No other balancer of grain procurable, cost considered, can compare with it, where it may be grown on the farm.

It is also, not only the best, but the cheapest, to feed with silage. Spoiled hay, if fed to milk cows may cause the milk to have a disagreeable taste and odor, but the best milk smells no better than properly cured alfalfa hay, and cows may be kept in full milk flow longer and cheaper on ground kaffir corn and alfalfa hay, than any other two feeds ever tried by the writer. Indeed, past experience seems to prove that kaffir meal is better than Indian corn meal for this purpose. The results of such feeding are apparent in the improvement in flavor of all the products and in firmer butter. Sensational writers and calamity howlers, who are always painting doleful pictures showing a dearth of beef, pork, and mutton, looming up in the near future, followed by the gaunt form of death from starvation, have no foundation in fact, upon which to base such dire predictions. On the contrary, if we should put a proper proportion of the land in these United States to alfalfa, and feed it to livestock, we would be able to feed the world with meat, and have milk to spare for bathing purposes, butter for axle grease and cheese to make a moon.

Stage of Development to Cut for Hay.

Like many other farm operations no hard and fast rules may be laid down by which we may be unerringly guided as to the exact time when it is best to cut alfalfa for hay. Some growers make a practice of attending to this hay crop only when other crops are not loud in their demands for attention, and while there is no crop which will smile through a period of neglect brighter than alfalfa, yet there is a time when it is best for the plant, as well as best for the value of the crop secured, at which it should be cut. The problem, is to be able to know when that time arrives. A rough outline may be marked as follows:

For the first crop of the season, cut when the lower leaves are turning yellow and falling off and new sprouts springing from the root, crown and lower stem, regardless of whether it is in bloom or not. For other crops cut when about one tenth in bloom. Seasons differ, conditions as to heat and moisture differ, and many other contingencies may vary this tentative set of rules very materially. One season may bring the first crop to maturity full thirty days earlier than another. The crop for hay is mature when the feeder roots have gathered practically all the necessary food required by the plant to produce seed, and have nothing further for the time being to do except furnish the necessary moisture to elaborate that food into germs for future plants. If cut before this stage, it results in an injurious shock to the root system, and a consequent diminution of the following crop. Cut at the proper stage, when the roots have practically performed their function as to supply of food for the plants above them, they are in a state of temporary rest. In removing the practically finished plant and

the consequent drain for moisture, the roots naturally, though slowly, seek an outlet for any surplus food on hand, and place it in the buds at the crown. Though at first the reawakening life comes slowly, yet later under the demands of a new crop of active breathing leaves, the whole plant rushes with its activity accelerated and its added vitality apparent, onward, toward the goal for which all creation strives the fiercer, if balked or delayed in its first effort at reproduction.

Drying the Hay.

This process consists in getting rid of a large per cent of the moisture contained in the living plant, and it is generally conceded that the sooner we can accomplish this end, the better the product. To accomplish our purpose it is necessary that we follow the provisions of nature so far as may aid us in our object. The leaves being the natural vaporizer of moisture contained in the tissue of any plant, it follows that we should prolong the activity of their functions in order not to retard the escape of moisture. When they become dead and dry, they have no more power to draw moisture from the stem than if they were entirely separated from it. So we should protect the leaves from the drying action of sun and wind as long as the stems are yet sappy. When we see that the stems are practically drained, then, and not until then, have we used the best means at hand to dry the hay. The fact that the leaves die and dry up too quickly makes it unadvisable to leave the hay exposed too long to the hot sun and the drying wind in the swath. No time can be set for raking into windrows. Conditions should govern, and the hay should be put into the windrow promptly, when properly wilted. And here let us explode the popular fallacy which is to the effect that "Hay should never be cut when wet with dew or rain", for which there is no foundation in fact. On the other hand there is no better time to run a mower through a heavy stand of alfalfa. The moisture from the dew or rain keeps the knife clean and free, reducing the draft and the wear and tear on team and tool. Besides, the globules of adhering moisture protects the leaves from too fast drying, thus prolonging their natural functions, and hastening the process of getting rid of the moisture contained in the tissue of the plant. The leaves, or any part of the plant, will not absorb any appreciable amount of moisture, so long as they are actively performing their natural functions; therefore, not until the plant is dead, is there any excuse for avoiding dew or rain. If cut before fully developed, alfalfa like other forage crops, is very difficult to dry. An old rule, and a fairly good one, under most circumstances by which we may judge whether the hay is sufficiently dried to put up, is to twist a small bunch as you would wring a cloth, and if no moisture appears it may be stacked, or put under shelter in the barn. The

reader is warned, however, that in drying or curing hay, so many varying conditions of the atmosphere occur that what proves a safe rule to follow for one crop or even one day's cutting may utterly fail for the succeeding one. However, if you are sure the stems of the plants are sufficiently dry you may now proceed to stack or mow your hay.

Stacking or Storing Hay.

Now that we have our hay in the windrow, many writers and more farmers, especially in the eastern states, advise us that the next step in the procedure is to shock it. And some extremists insist on covering the shocks, each one, with an umbrella to keep the sun, rain, and dew from damaging the hay while it cures. This advice may apply to the farmer who has sufficient help to follow this exacting and expensive operation, but it is practically impossible on soils where alfalfa matures a crop every thirty days. Some crops are so heavy that the shocks, in order to be shocks, and not stacks, would need fifteen or twenty per cent of the field for room to stand on, for from five to ten days, according to the weather. When we consider the plants that are prevented from growing on account of the smothering effect of the shocks, the added loss from mould and possible flooding by heavy rains, the all but prohibitive expense for the covers, the unavoidable damage done the succeeding crop by men, horses, wagons, or other tools, turned loose on it, crushing the tender growth, together, with the added unavoidable useless labor and then failure in turning out a first class evenly cured crop of hay under such conditions, the plan of curing in the shock is absurd. So, without hesitation, the writer advises putting alfalfa hay into the stack from the windrow at once, if we can. If for any reason this cannot be done promptly, bunch it with a horse rake temporarily, to prevent it from becoming too dry, to protect it from the injurious effects of the direct light and heat of the sun, as well as from the dew and rain. In any case, we should exert our best energies to get it into the stack or mow before it is dry, so that it may settle closely enough to generate heat in the curing process sufficient to prevent mold. Stacks should be large as is convenient, and high as will securely stand upon their foundation, and covered with any material at hand that will shed rain. One crop of hay properly saved may be worth more than half a dozen that are merely made.

Tools Used.

Therefore, tools adapted to the quick handling of this crop are advisable, even though we have no more than twenty-five or thirty tons of hay, especially if it is to be stacked, because a stack put up by hand soon settles down until it is a mere blot on the face of

nature, with so large a portion of the contents exposed to the elements that it is soon a blackened, moldy mass of refuse, fit only to use as a fertilizer, having lost sufficient food value, in some cases, to pay for a respectable outfit of tools. The handling of a large hay crop cannot be accomplished economically without machinery, but there is a bewildering array from which to choose and we are in danger of spending good money for a useless tool, unless we understand first, what is best suited to our individual needs. To start with, the mower should be as large as the nature of the land will permit. On smooth land an eight foot mower is economically handled by a pair of 1500 pound horses. A sharp knife should replace the one in use every quarter or half day for hay crops, and once a day for seed crops. A steel horse rake for placing in the windrow is necessary, the self dump preferred. If stacker is used a three or four wheel push rake is needed, and for stacker, the simplest machine, has so far proved most satisfactory. The overshot to which the hay is delivered by the push rake is one of the simplest, fastest and most satisfactory stackers with which the push rake only is used. Simpler yet is the Derrick stacker and the Cable. The Derrick or the Cable stacker may take hay from a wagon by means of slings or forks. Tracks and forks are used to best advantage in a barn. Besides we have a few tools which prove useful at times and in certain localities; such as the side delivery rake, the wagon loader and the tedder, each of which is worthless under some conditions and all of which may be dispensed with. The loader, however, may be used to advantage in filling a high barn quickly and cheaply.

In this connection the writer suggests that eventually the silo may take the place of both the stack and the barn as the most economical place for storing, curing and protecting hay. Instead of putting the hay into a stack, shed or barn when it is ready to be taken from the field, it may be brought to the silo, run through the cutter as if for silage and stored in the silo. If put in in the right condition, no conceivable surroundings could make a better grade of cured hay, and no building could hold more hay in the same space. The silo used for this purpose should make the storage of hay a comparatively simple matter.

Curing.

Hay or any plant like tobacco can be cured properly only in bulk, and under pressure which is sufficient to largely exclude the air. Moisture must be present also, else no change on account of bulk, pressure and exclusion of air will occur, and the result will be only a pile of dried plants. Curing consists in the action of microscopic plant life on the tissue of the material to be cured. The germs of these microorganisms are present in the air and on

the plants, and, given the conditions as above stated—bulk, pressure, moisture and the exclusion of air—these germs spring into active life, accomplishing a remarkable change in the flavor, taste, and digestibility of the material, at the same time generating heat, and throwing off the excess of moisture. Here again, conditions of the atmosphere are so variable that intelligent observation and a careful study of the requirements as to the moisture content of the hay when stacked, or placed in the mow, should govern. A certain degree of heat and exclusion of air is necessary to prevent or kill mold.

It has been said that there is no such thing as spoiled alfalfa hay, but a very casual observer would soon learn that moldy alfalfa or any other kind of hay is spoiled. Mold is irritating to the eyes and lungs, and to a degree poisonous to the stomachs of all animals and should be avoided as such.

The curing of hay is the most important operation with which we have to deal in this work. To convince the most skeptical of the truth of this statement, offer a cow or horse two bunches, one of cured hay and one merely dried hay, and see which will be eaten first. Smell the smoke of two cigars, one of which is made of properly cured tobacco, and the other made of tobacco which has been merely air dried. The art of curing hay has not engaged the attention of scientists to any such extent as curing tobacco, the making of wines and other products, probably because the farmer is too independent to ask for help, while manufactures employ a man of science to unravel every knotty problem. Since bulk and pressure are both an aid in the process of curing our hay with the least possible mold, it follows that mows should be large and deep, or stacks large and as high as possible. It is advisable then to use machinery capable of raising the hay at least twenty feet above ground.

Hay that has been bleached or otherwise damaged by dew or rain may regain to a degree its color and flavor in the stack or mow if gathered before it becomes too dry. Otherwise it should be placed by itself and classed as second grade. Moldy hay, if fed at all, should be fed out of doors, and never in a manger, because there is danger to both the eyes and lungs of animals eating it, where the dust will not be rapidly carried away by the wind.

Value of Alfalfa Hay as a Feed.

The writer has no means at hand by which the value of properly cured alfalfa hay may be determined. True the chemists have made many analysis. Experiment stations have tried out the feeding value of alfalfa hay alone, and in combination with other feeds, and individuals by the hundreds have followed various plans, and all are unanimous in its praise. Yet practically all

of these reports fail to mention the quality of the hay used, and even if they had, we might not know much more than at present because, so far, we have no generally accepted standard of quality that covers the necessary requirements. The chemists tell us that the hay is worth \$7.50 a ton as a fertilizer, because at the market value of the nitrogen and other elements of plant food contained in a ton of this hay, these elements would cost us that much if we bought them in some other form. The chemist, however, fails to tell us how much more it is worth to the soil than its separate chemical elements would be, on account of its physical effects upon the soil. For instance, if the same elements in their chemical state were applied on one plat of ground, and a ton of alfalfa hay on another of equal size, and both intimately mixed with the soil, the result would show largely in favor of the hay.

The fact that corn belt feeders buy our hay at from \$5.00 to \$15.00 per ton and ship it hundreds of miles to feed with their corn and secure a profit, should indicate that for home consumption it is worth about \$25.00 per ton, if it is well cured hay. That would make it practically equal in value to wheat bran, and if it is worth as much as wheat bran to feed, which is coming to be generally conceded, we are growing from three to five tons of wheat bran per acre on our alfalfa soils every year, at a cost of about \$2.50 per ton. Staggering figures, and true, only for the farmer who knows how to grow, care for, and feed this crop. Alone it is scarcely worth as much as timothy hay fed alone. Fed with grain, in proper proportion, one ton of alfalfa hay is easily worth as much as two tons of timothy hay regardless of how the timothy is used. When we sell our hay we present to the buyer, free of charge, \$7.50 worth of fertility and about one-half the profit on the feeding value, all of which we may keep at home for our own benefit when we learn the full value of this wonderful crop.

So then, to sum up the experience of feeders and the report of experiment stations, and my own observation, I should say that alfalfa hay may vary in feeding value according to quality of hay, and the manner in which it is fed, from \$5.00 to \$30.00 per ton. To illustrate - An animal given all the alfalfa hay it will eat and allowed no other feed, grass, rubbish or straw, will come through the winter in about equal condition with one allowed the run of weathered dead grass, straw, picked over stalk field, brush and such other refuse; while another animal, besides the alfalfa hay, allowed wheat straw, timothy hay or even saw dust, may show a decided gain; and yet another, allowed the alfalfa together with grain proportion, will thrive. In other words, certain portions of the animal's body is made up of the same element that are found in alfalfa, and other portions are made up of elements not found

in alfalfa in sufficient quantity, so that more of the plentiful element must be taken into the stomach that is needed, in order that sufficient of the rarer elements may be secured to keep the body complete. And all eaten that is not needed, passes through the alimentary canal and is wasted. Evidently then, in order to prevent waste, and secure the full value of alfalfa hay it is necessary to feed in connection with it, some other material, which, when combined with alfalfa, contains all the elements needed by the animal in the exact, or at least approximate proportion to the need of the animal. The feeder should consult experiment station reports on experiments conducted for this purpose.

Growing Alfalfa Seed.

It is a provision of nature and command of the Author of all life, to be fruitful and replenish the earth, and man was further commanded to subdue the earth and have dominion over every living thing. We are not only granted dominion over all living things but allowed to use the forces of nature in aiding us, and it is the forces and laws of nature that we must understand before we enjoy the full benefits of this great privilege. Some of the laws we understand, and we control some of the forces of nature to our advantage. We know that in order to multiply, animals need room for active motion and plenty of suitable food, as well as a degree of shelter from extremes of heat or cold. Also that plants need room in which to develop both above and below the ground, food in plenty for their full development, as well as unobstructed sunlight and air. Then in order to secure a full crop of alfalfa seed the plants should have first, suitable soil, and second, plenty of room. Most of the seed grown is a mere by-product of hay fields, which are often neglected until the owner discovers that the stage of development is past that for best hay, and it is left to go to seed if it will. Others, believing that there may be more profit in seed, have wasted many valuable crops of hay in the vain hope of obtaining a paying crop of seed, when conditions are all against them. Few have observed the requirements necessary before a reasonable assurance of a paying crop may be expected.

Many years of experience and observation lead me to the conclusion that in order that a seed crop may be worth more than hay might be, it is necessary first, that the stand be not so thick as to prevent a fair development of branches. That growth be only moderately rank, and that all the plants should come into full bloom at the same time. Having these conditions, it is advisable to note whether seed is forming on the lower portions of the seed spike. If they are failing to set pods, and the bloom is falling off, it is not too late to cut for hay, and it will yet make good feed for horses. If the pods are showing in the first blooms which show signs of drying, and the weather is fair with only

sufficient moisture to keep up a moderate growth, the prospects are favorable. However, development should be noted daily, and at the first sign of failure, the crop should be cut for hay at once. If conditions remain favorable, the seed may be ready to cut within thirty days after the beginning of the blooming. Here close observation and judgement are necessary, in order that it be not cut when too great a proportion of the seeds are yet green, or left so long for the last green pods to ripen that a large per cent of the seeds first ripening are shattered out. The seed hay should be raked while the dew is on in order to prevent waste from shattering. In fact, all the handling to the stack should be done if possible while soft. There is no danger of heating in the stack of a seed crop that is worth threshing, because there is at this stage little moisture in the plant, and the stems are too stiff to settle compactly. In threshing, use a machine made for the purpose, if you expect to get a fair share of the seed. The Birdsell is a good type. When you have your seed in the sacks, take time to figure whether you have really lost or gained, before you price it. With hay at a given figure per ton, and two crops lost outright, and the third crop diminished in weight on account of this seed, together with the extra expense of the thresher, you may be able, if you have four or five bushel per acre, to show a profit from growing seed instead of hay. This is the general experience. Most of the reports of great crops of seed are cases where the conditions just happened to be right. Growing seed on fields sown for hay has proved an uncertain business, and if the hay lost in the operation were charged up to the seed, as it should be, for a term of years, we should probably find we had suffered a marked loss. I have grown two crops of seed only, during my whole experience which cost me in hay and other expenses, less than \$10.00 per bushel, and measured by this standard, one crop of more than two bushels per acre cost me more than \$20.00 per bushel. To be specific, hay was worth \$16.00 per ton, and on account of letting this crop go to seed, I lost three tons of hay. The seed was poor and after threshing bill was paid, I netted about \$12.00 for the seed. Experience and observation have led me to investigate on a small scale the "row" method of growing alfalfa for seed production, and while I am not prepared to say what the results might be if followed as a business proposition, I am convinced that in the near future our seed will be grown in rows, cultivated probably, by the same tools, and in the same way that we now cultivate our corn or other crops. Indeed, much land which is now considered not adapted to this crop, or land where alfalfa has proved unprofitable when sown broadcast, may prove by the row method and cultivation to be practically equal to what is now considered alfalfa land, not only for seed but for hay and pasture as well. The plant will be found capable of utilizing all the room below the ground and most above

ground in rows three feet apart, if properly cultivated. A Planet Junior garden seed drill, or some similar type, should serve for sowing the seed, which should be placed shallow, on the level, and not in listed furrows. A generous quantity of seed should be used as it may be thinned to some extent by cross harrowing before the plants are large. One or two pounds per acre should give a matted row when six inches high.

Baling.

In order that nothing of interest concerning alfalfa, with which I am familiar, may be omitted, I shall say a few words about baling the hay. Baling the crop that is to be fed on the farm, is usually, added labor and expense which is seldom justifiable. There are times, however, when it may be advisable. So then for home use, it is best usually, to bale from the stack or mow, after it is cured, and while it is yet soft, or during weather that would render it soft, so that all the leaves may be retained, and none of them reduced to powder, as often happens if this operation is performed while the hay is dry. It is usually not advisable to bale from the windrow, for the reason that if it is dry, much unavoidable waste of leaves occurs, and if it is not dry, it is very liable to mold in the bale. And for the further reason, that the bulk of a bale is too small for the best action in the curing process, as before described, and which should be recognized as the finishing process in manufacturing the best possible stock food of which alfalfa is susceptible. Many farmers will continue to grow this crop for sale, regardless of the very evident fact, that in doing so, they are not reaping the full reward for the real value of their product. And yet others are so situated, or may at times become so situated, that to sell the hay is their only present opportunity to realize on their investment and labor. To all such, the character and quality of hay commanding the highest market price is what is most important, regardless of its real value. And the demands of all markets are simple, in that all they want is that the hay be bright, green and dry. The markets have not yet learned the difference between merely dried hay, and the finished product, or cured hay. It is not advisable to market hay which has been baled from the swath, inside of ten days or two weeks, on account of the liability of arriving or soon becoming, hot and soft. Better place it in bulk first as closely as may be, and exclude the too free circulation of air between the bales, until the heating and drying stage in the process of curing has progressed beyond the point where mold may occur.

Cultivating.

Under certain circumstances, it may be desirable to loosen the surface of the soil in old alfalfa fields where pasturing has render-

ed the surface too compact to absorb the rainfall freely, or to tear out wild grass which may become troublesome. Various methods and defferent tools are advocated to remedy these conditions. There are objections to the disc in that if the soil is dry, many of the crows will be split or partly cut away, both of which often cause a decided loss of hay, until the plants have time to recover from the injury, if they ever do. The author is fully aware that some have used the disc for the purpose of splitting the crowns, in the vain hope and belief that they may thus thicken the stand. The reader is confidently advised that on soils suitable to this crop, plants one year old need not be nearer than twelve inches of one another, and that in the course of time the crowns of many will be inter-locked with their neighbors, if not tortured with tools such as discs, spike toothed harrows or the renovator. On soils subject to the encroachment of grass, these tools may be used to some advantage in the absence of a better remedy, also a new tool which has small hoe drill shaped plows that are swung so that they are free to move to the right or left and thus dodge the crowns of the alfalfa plants as they move forward. This tool may also be found desirable for loosening the surface of pastured fields with less damage to the plants than probably any other tool.

The unobserving man, however, tortures his brain, devising means, and ways, and tools, and fine spun theories, for the benefit of his crop, often spending, uselessly, time, labor, and money, only to find that nature has amply provided for every contingency. Pasturing a field of alfalfa or any other forage crop so closely that it is bare, and the surface trampled hard is doing violence, not only to the soil, but to the crop pastured; and nature at once sets about to correct the abuse by the use of plants adapted to such conditions; always selecting for that purpose varieties unsuitable for the animal, or, I might better say, the man, who is responsible for the wrong. Indeed the first appearance of weeds or grass in fields of alfalfa which have had time to become established, is, and should be accepted as evidence that some law of nature has not been observed; and any attempt by the use of tools to right the wrong is only prescribing for the symptoms, like a quack doctor. The intelligent farmer will search for the cause of these symptoms (weeds) and avoid unnecessary expense by correcting the faulty condition if possible; and if he cannot do so, he will abandon that crop, substituting some other, which is adapted to the conditions. If we have unavoidably abused our soil by pasturing until the surface is packed we may yet confidently depend on the forces of nature to correct the evil without the intervention of man-made tools. Insects, burrowing animals, growing vegetation, and the expansive forces of freezing during winter besides the action of microscopic plant life in the soil, will in a short time, correct the worst condition. Cultivation in midsummer for the purpose of

conserving moisture, or for faster absorption of rainfall, if it may be accomplished without undue injury to the crop, should be beneficial, but any cultivation during winter or early spring before all freezing weather is past invariably retards the maturing of the first crop. The reason for this should be evident to any observing mind. And yet, we are advised by so-called agricultural teachers, college professors, speakers, writers for our farm papers, and even alleged scientists, that cultivation and pulverization of the soil permits the freer circulation of air through the soil, and in the next breath, tell us that the same pulverization of the surface, conserves moisture, by excluding the too free circulation of air, wherein consistency is prominent by its absence. Some of them are magazine "back to the land" men, some "city flat dwellers for fair," some "sons of the soil second hand men" and all have "calouses made by a chair." This fault finding is not intended to convey the idea that these men are dangerous parasites, nor that they are useless. On the contrary, most of the useful knowledge that any of us possess, was handed us from past discoverers through these same writers, speakers, teachers and scientists. But in order that they truly teach us, we must first think for ourselves and prove, by actual application, the value of what they tell us. To err is human, and we all have our limitation; therefore, let us be charitable, and explain to them that there is something wrong here. Let us say that the soil breathes literally, that at every varying pressure of the atmosphere the earth inhales or exhales air as truly as living animals, and when we go scratching across the face of it, we are likely to disfigure its nose, and obstruct its breathing organs so that much less air may pass back and forth. Moisture escapes through evaporation, and evaporation may occur beneath the surface of the soil as readily as at the surface, but it may not escape so readily. Cultivation prevents its escape to a degree. The controlling factor which governs the motion of the air and vapor in the soil, is the pressure of air that surrounds the earth. This pressure is invariably greatest on cool, still nights when frost or freezing occurs. During such weather the earth inhales much of the lower and colder strata, and at the same time radiates heat from the surface, materially lessening the severity of the cold.

Now cultivating and pulverizing the surface not only obstructs the movement of the air and vapor in the soil but in the same degree the movement of heat. Less air and vapor and heat will pass into, or out of the surface of the soil if it has been disturbed, causing damage to all kinds of early vegetation. The observant reader has probably noticed this fact in the case of early garden truck. On cold nights cultivated plants are likely to suffer when those uncultivated may escape the frost. It is bad to lose a crop through neglect, but worse yet to lose it through misdirected effort.

Reseeding.

Contrary to general advice, alfalfa, on suitable soil, may re-seed itself, or be re-seeded easily, if properly handled. If the stand is regular, it may be left to go to seed; then cut after a portion of the seeds have shattered from the pods. After the crop has been removed, the field should be disced lightly, and harrowed, and the new growth from the old plants kept closely clipped, until the new plants are well established. Under favorable conditions this should not take longer than thirty days, during July, August or September. If your alfalfa crowns do not spread until they are from four to ten inches across, in the course of three or four years, you may charge it to your soil, your seed, or else to the fact that your stand is unnecessarily thick.

Plowing Under.

Fields which have become infested with noxious weeds and grass should usually be plowed, and put to other crops. The best tool for this purpose is probably the common prairie sod plow, on which a lay made for one size larger plow is used, so that it may cut a wider furrow than is turned, being careful that the extra cutting is done on the furrow side, so that no roots escape uncrowned. In order that the crowns may not take root and grow again, it may be necessary to harrow the field over several times, at intervals. Plowing alfalfa to a depth of from two and one-half to three inches should kill it, unless the crowns have been buried by sediment from overflow; or soil drifted by the wind, in which case, deeper plowing may be necessary to kill the plants. If plowed deeply, much difficulty may be experienced in preventing the crowns from taking root anew.

Enemies of Alfalfa.

Included among the enemies of alfalfa, are animals, insects, and plants, together with a few diseases. Its animal enemies are pocket gophers, prairie dogs, rabbits and field mice, with possibly a few others, all of which however, are of minor importance. Though the gopher, if not checked, may prove at times, formidable. The very best remedy I know for gophers is the little brown weasel. A crystal of strychnine placed in Irish or sweet potatoes cut in small pieces and introduced, through openings made by a prod, into their runs, will usually get them. Poisoned raisins are also good. Although the pocket gopher deserves great credit for the immense amount of good he does by his industrious tunnelling and mixing of the soil, it is very exasperating to have to cut through his mounds or else leave a ragged scar on the face of what might otherwise be a smoothly mown field. Of the insects the web worm is a cause of great loss. It will no doubt prove necessary in order

to check this serious pest, to resort to poisons applied by the spray pump, if the worms attack the crop in its earlier stages of growth, and to the mower, promptly, if near ready to cut for hay. The same measures may destroy the army worm. Poison by spray, or bran mash or criddle mixture, the grasshoppers. Blister beetles may also be poisoned. The alfalfa weevil is a serious menace which many of us may have to combat in the near future. Pasturing in winter until the ground is naked is recommended, together with cleaning up all rubbish in and surrounding the fields.

Among the plant enemies are dodder, fox tail, crabgrass, wild grass, and Russian thistle, of which dodder is the most feared. This is a parasite plant the seeds of which germinate in the soil as those of other plants; this is, however, the only direct use it makes of the soil. It sends forth a slender fleshy tentacle which, on coming in contact with living plants, promptly coils around them, sending roots or feeders into the body of the plant, sucking the life blood from its host, ever reaching for new victims in a constant widening circle. Burning where it grows is advised, as it is difficult to gather, on account of the liability of overlooking detached portions which, if they come in contact with the host plant, will promptly regain a hold and continue to grow. Dodder is easily recognized by its yellow color, and slender tendril like vines, which reach from plant to plant, and cross and recross each other, holding in a mat the surrounding plants upon which it feeds. Dodder attacks only certain plants, and if it be forcibly torn from its host, it is entirely helpless and will die in the course of a few days, unless it comes in contact with some other plant suitable for its needs. Hence, the old superstition prevalent when the writer was a callow youth, to the effect, that it held supernatural powers of life. How beautiful and untaught the faith of the youth, who wished to know without the ordeal of asking, if the object of his or her affection entertained the same regard to the hopeful smitten one. The tendrils being thrown over the head backward, the while a wish being repeated, and the spot being marked where the clinging yellow tendrils lit; then some days later upon revisiting the spot, finding the little vines living and growing beautifully, if they happened to light on a suitable host; or dead and dried up if they did not. The living plant was an answer in the affirmative causing the young heart to sing with gladness; or if dead, a momentary regret, then a new object chosen for rejected affections. How our dear innocent hearts should have recoiled in horror, could we have known the sinister import, or revoltingly cruel character of the beautiful plant we used with such artless credulity!

Crabgrass may be discouraged by the application of limestone, or gypsum, which is another form of calcium. The effect of calcium is to discourage the grass and improve the alfalfa, which is double progress. Foxtail is a serious menace where, for reasons

of unsuitable conditions, alfalfa fails to grow freely. The presence of wild grass is also an indication of unfavorable conditions for the alfalfa to make a good growth, and is an attempt of nature to fill the vacant spaces with vegetation adapted to the condition. Obviously then, the remedy is to fit the conditions and soil to the needs of the alfalfa, and all our troubles in the shape of grass will promptly disappear.

Alfalfa as a Honey Plant.

There is no doubt of the importance of alfalfa as a honey plant, affording as it does a constant succession of fragrant flowers within which the bee may find the choicest of sweets from May to October in Oklahoma. Because of the fact that different fields are out at different times, some neglectful farmer being sure to let his crop stand too long for best hay, or some other field is being let go to seed, the busy little bee fairly revels in the sweets of the sea of purple blooms. Yet, however useful the plant has proved to the bee, there is lacking positive proof that the bee is not a thief, stealing the poorly guarded nectar without the compensating act of carrying pollen from flower to flower, as she is popularly supposed to do. The writer believes that she purposely dodges this beneficent act of cross fertilization. Certain hermit bees and the great bumble bee invariably spring the bloom. The embryo seed pod is enclosed by two leaves of the flower, which cup together as your two hands when placed together with fingers extended and which, when lightly touched anywhere at the points represented by the location of the ends of the fingers, spring open with startling suddenness, and this act of opening, releases the long finger shaped embryo which strikes the insect or object touching it with remarkable force for so small an object, at the same time scattering a tiny cloud of pollen, like dust in the air and on the prowling insect. This finger-like organ crooks with a quickly curving motion and often impales the intruding insect for a time, from which after it has secured the nectar at the base of the flower, it extricates itself with difficulty, and invariably comes out of the struggle well dusted over with pollen.

The honey bee, and some other insects, seem to avoid this violent treatment, by inserting their proboscis at points unguarded by this cunning provision of nature, and literally steal the sweets, thus refusing to give value received. There are times, however, when bees need pollen badly with which to feed their young, then they purposely spring the flowers carefully, rake the pollen grains dusted over their head and body together, place it in their baskets and carry it home.

Irrigation of Alfalfa.

Much might be written on this interesting subject which could be of little value to the reader, because of widely varying character of soils and waters. Yet attention to details is fully as necessary to insure success with this crop under irrigation, as elsewhere. First, we must have water suitable for the purpose, and of sufficient quantity. Impurities of various matter of mineral origin in solution, of which the sodium compounds in excess, are most undesirable, often render an otherwise adequate supply of water unfit. So the first care is to learn the character of available water, its cost and quantity. Then the character of the soil for considerable depth must be known, so that water may be applied intelligently, and as needed, equally over and through the whole area. Having all necessary knowledge of the character of the soil and water at hand, we may proceed to other and yet more difficult problems, such as the amount to apply, which may vary materially on different soils and for different crops, climates and seasons. All cultivated crops, with a few exceptions, require more air in the soil than is found in water; therefore an excess of water in the soil retards, and, in the case of many plants, prevents growth. And in the case of alfalfa we find an excess of water much more speedily fatal than its entire absence. Proof of which may readily be had in regions where rain does not occur. For example, several years ago while on a visit in Delta County, Colorado, the writer's attention was called to a field of thriftily growing alfalfa which, through a break in the ditch, had been left high and dry above any possible water for three years in succession. This field of about forty acres showed a straggling growth during the early part of the first season, but soon became brown and bare, and remained so until the break was repaired. Everyone passing, the owner included, supposed the plants were all dead. So on the third spring, water was again turned on in order that the land might be plowed and seeded to some other crop. For some reason, the plowing was not attempted for a few days after the application of water, and when the owner did finally turn his attention to that field, he found a perfect stand of alfalfa, growing as freely as though it had not lain dormant for practically three years, during which no rain fell in sufficient quantity to start vegetation of any character. On investigation, the writer found no reason for doubting the credibility of a number of witnesses to the above statement. Indeed we see ample evidence of the ability of this plant to remain dormant through more than half the latter part of our long dry hot seasons of the South-west, during summers of short rainfall, and come through the experience apparently unimpaired, quickly clothing the earth in a welcome garb of green, after the first rainfall.

The depth and character of the soil, should decide the amount

and frequency of application of water, where little or no rain occurs. Where rains are prevalent, less water is needed. Few conditions as to soil and climate call for more than one application for each crop, and many not more than one during the whole season.

Life of Alfalfa.

Alfalfa like all other forms of vegetation has its limitations, and while it is a perennial, it may soon succumb before the trials of an unfriendly environment. Seeds that fall by the way side may soon be choked by thorn and bramble; those on shallow, stony soil may linger for a season, but others sown on fertile soil, may live to gladden the hearts of our children's children. There are fields in the United States which have survived with apparently undiminished vitality the vicissitudes of more than thirty seasons. In Mexico, according to well authenticated authorities, is one field more than eighty years old. And in the high altitudes of the Chilean mountains, it is said to have grown and thrived without renewing for full two hundred years. With each recurring season it springs anew, one of the first plants to clothe the awakening earth in living green; in the month of roses its blossoms overflow our fields like a purple sea, and after successive crops of hay of untold value, or seed of all but immortal life and honey fit nectar for the gods, it modestly retires for a period of rest within the kindly bosom of Mother Earth confidently awaiting a resurrection to a future life more full of promise to man and treasure to the soil. It is a fit harbinger of the springtime of our youth, glorious example of the strength of our manhood, prophetic evidence of the hand of God.

And now the author of this book has performed his mission and feels a glow of pride in being able, though a farmer unused to leaving the hoe for the pen, to place before inquiring minds in simple language the results of more than half a century of study, work and investigation.

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